Design Isochronous channel in MANX

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Introduction

- I want to realize isochronous condition in MANX
- Cary has found instability of beam phase space in isochronous HCC
- I try to figure out the optimum condition based on Slava&Rol's paper

HCC parameters

Inequality condition for beam stability

$$0 < G < R^2$$

$$G = (q - g)\widehat{D}^{-1} \qquad R^2 = \frac{1}{4}(1 + \frac{q^2}{1+\kappa^2})^2$$

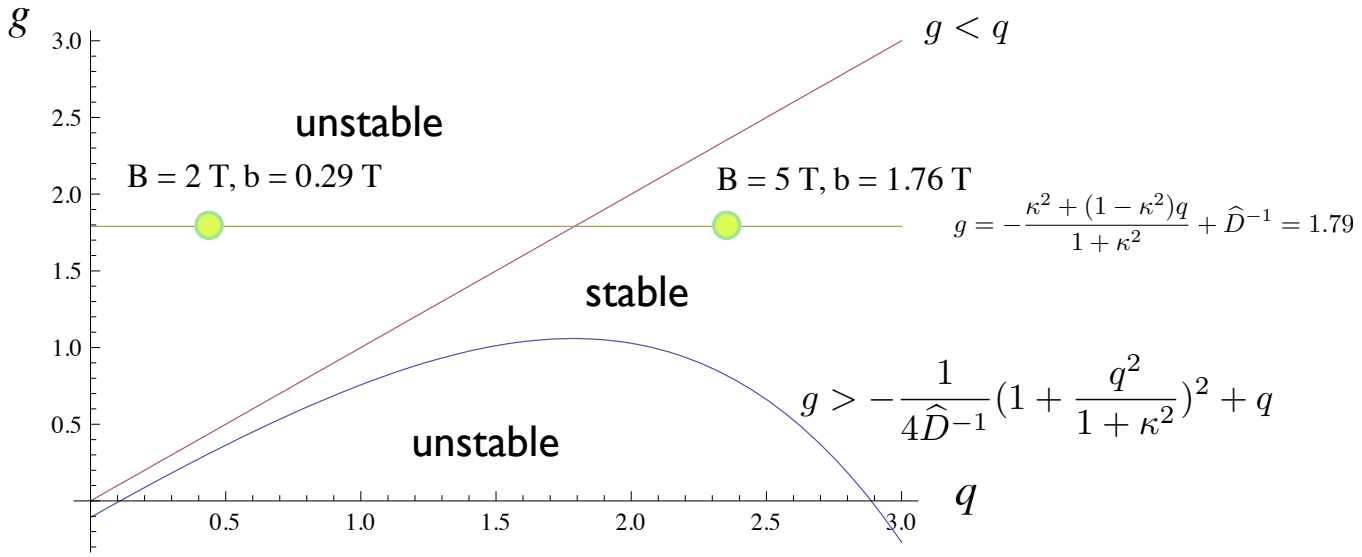
The stability condition represents by using q and g

$$g > -\frac{1}{4\widehat{D}^{-1}}(1 + \frac{q^2}{1+\kappa^2})^2 + q \qquad g < q \qquad q > 0$$

Dispersion factor is determined to satisfy isochronous condition (or equal cooling decrement)

$$\widehat{D} = \frac{1+\kappa^2}{\kappa^2}\frac{1}{\gamma^2}$$

q-g plot

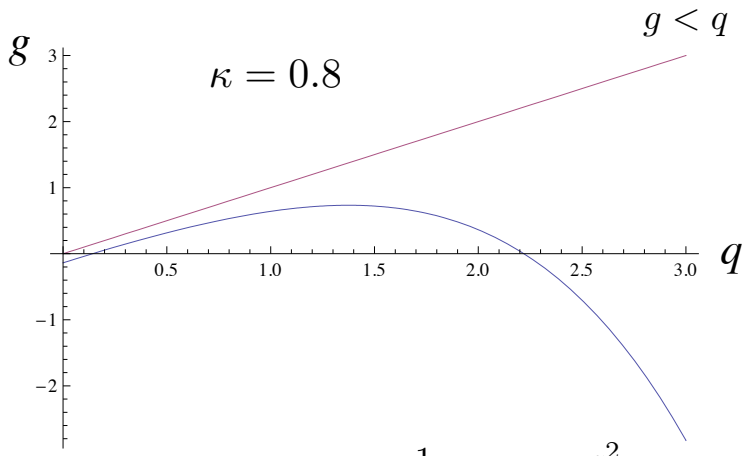


$\kappa = 1.0$

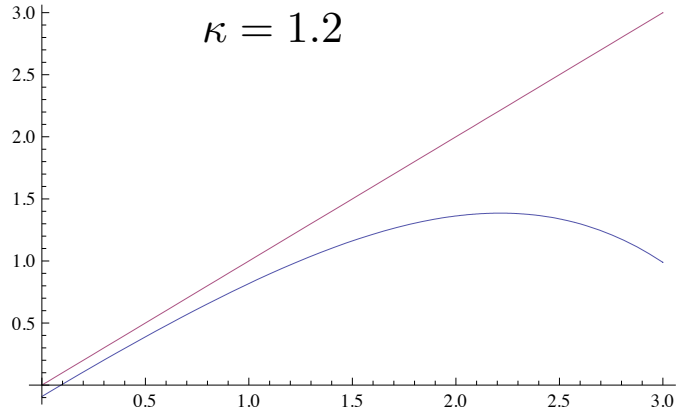
$\lambda = 2.0$ m

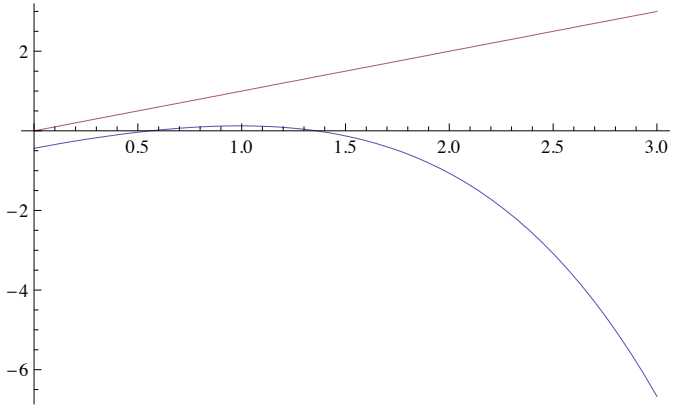
$p = 200$ MeV/c

Geometry dependence



$$g > -\frac{1}{4\widehat{D}^{-1}}(1+\frac{q^2}{1+\kappa^2})^2 + q$$





Equal cooling decrement

Wide stable band

Conclusion

- First time look at stable condition
- Naively explain about instability in numerical simulation
- Better to tune q value instead of B
- Verify that equal cooling decrement condition has large acceptance
  - Wide stable band